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25X1

12 August 1965

Please Reference:
A51-65-3326

Gentlemen:

We are pleased to provide the first in a series of Monthly Progress Reports covering the effort expended on subject contract during the period of July 5, 1965 to August 1, 1965.

Program

During this first month, in addition to continuing certain investigations begun under the previous contract which are described later in this report, we have had several discussions with your technical staff concerning the content and direction of the current program.

The result of these discussions has been the elimination of the beginning of the Contamination Study Program and the Viscous Processing Study in order to obtain maximum emphasis on the study of heat shock techniques. We are also instituting a study of Film Drying Techniques which promises to be of significant and immediate practical worth.

Attached are single page synopses of the research tasks of the program as it is now constituted.

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Research Program

1. Air Bearing (Tunnel)

Experimental evaluation of the Tunnel-Type Air Intertank Transfer Bearing is essentially complete. It was powered by a single [redacted] pressure/vacuum, blower, Model IS 11520 (the same unit as will be used on the Positive Pressure Transport Capstain tests), a number of efficiency/capacity tests were performed prior to the bearing tests. These were compared directly with the manufacturer's rating curves and suitable graphs were prepared. 25X1

To facilitate testing, a large, calibrated, [redacted] meter was borrowed at no charge from the [redacted] 25X1 25X1
This instrument was capable of reading a total flow of 23,000 cfh with an accuracy of - 1.6 percent. All readings were corrected and the blower output measured. The blower proved to be about 10.6 percent more efficient at the same rpm when used as a vacuum pump than it did as a blower.

The tunnel bearing consists essentially of three concentric U-shaped sections of sufficient length to handle 9-1/2-inch wide film. The two inner sections are perforated with a pattern of holes through which opposing jets of air can be injected. The film path is between the center of these jet streams and surplus air is bled off through a series of side vents. Previous tests showed the film supporting characteristics to be somewhat erratic and high-frequency vibration was introduced. One of the main objectives of this phase of the program, then, was to improve the prototype design and operating capabilities.

Toward this end, sump-type air traps were added to the inlet and outlet sides of the bearing and the unit retested with medium-base film while suspended over a tank of water. Some difficulty was experienced from the fact that the emulsion side of the wet film is quite gelatinous and tended to cohere to the methacrylate surfaces of the bearing, thus causing uneven behavior. This condition would not occur in actual practice since developer and water do not have an analogous effect on the film and methacrylate would probably not be the material of construction. In this case, however, internal visibility was of paramount importance. This test will be repeated with leader substituted.

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By partially disassembling the model, it proved possible to measure the static pressure at each of the several hundred jet openings. These were then redrilled to balance the pressures closely. It is anticipated that performance can be further improved by fairing the pressure side of each of the jet orifices. These two tests are all that remain before compilation of the final report on this phase of the program.

25X1 2. [redacted] Liquid Bearing

The experimental evaluation of the rotary fluid bearing characteristics was continued with modifications based on three different stator cage configurations and changes to the squirrel-cage axial vane impellors. The first cage tested was constructed of a methyl methacrylate tube 4.47-inches O.D. and 4.23-inches I.D. It was machined with 24 slots, or gills, each 0.030 inches wide and approximately tangential to the inside diameter of the tube. Every other slot was discontinued in the center portion to leave a 1.6-inch island. The intervening slots were the full ten-inch length (slightly shorter at the inside due to the 2-1/2-inch radius of the milling cutter).

This configuration provided a stable cushion for 5- and 9-1/2-inch films at speeds of 157 and 230 rpm. However, the cushion was slightly eccentric being wider at the 9 o'clock position (with rotation clockwise) and sucking in at the 4 o'clock position. Bottom flow was eliminated by taping the slots and adding a strip of coving to the trailing edge of the cage and a strip of tape to the leading edge. Repeat runs showed excellent cushion stability and good centering for the 5- and 6.6-inch loops, but a tendency to drift when 9-1/2-inch film was tested. Restricting the slots at the center by a band and increasing the revolutions to 350 still did not improve tracking of 9-1/2-inch film loop. The performance, however, was still superior to the original helical cage.

A second series of similar tests was run using a polyvinyl chloride tube 4.5-inches O.D. and 4.05-inches I.D. The center island of alternate slots were 1.73 inches long. This P.V.C. tube allowed almost no clearance between the impellor blades and the interior of the housing cage and some rotational difficulty was experienced because of a slight eccentricity in the impellor diameter. The

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results closely duplicated the methacrylate cage and, again, only the 9-1/2-inch film required edge restraint to assure tracking.

The final tests were modifications of the series commenced during the last contractual period. For these, the thin aluminum perforated screen was used. There are 225 holes per square inch, each .041-inches in diameter which provides an open area of 29.7 percent. By making various changes to the outside of the cage and to the impellor blades themselves (to offset the center pressure effect), a combination was found which permitted 70 mm, 5- and 6.6-inch film loops to center well without format or speed changes. All three would immediately return to center after being moved to either side. A shallow edge flange was still necessary to prevent the 9-1/2-inch film from derailing. It is felt that a change in impellor design could correct this requirement. Record photographs were taken of these experiments.

3. Sensitometric Studies

The sensitometric studies now being conducted are designed to provide the photographic technician with a family of gamma curves. From these curves the technician may select any gamma that will best suit the subject matter being processed over a wide range of time-temperature combinations with the resultant effects upon resolution, chemical fog, speed and granularity. These studies are an extension of those conducted under the previous contract in which the same emulsions were developed to produce a constant gamma throughout the various time/temperature combinations used.

During the current report period samples of 4401 were prepared and processed at the 5 minute, 68°F level. These test samples produced an increase in gamma from the control sample, which was a gamma of 2.24 for 8 minutes at 68°F. Thus indicates that the 5 minute at 68oF test reached gamma infinity. In order to prove these results a time/gamma curve was developed. The study will continue at a developing temperature of 78°F, and a family of gamma curves prepared.

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U. S. Government

12 August 1965
A51-65-3326

Funds expended during the reporting period are approximately [redacted] 25X1

If you should have any questions or desire further information, please do not hesitate to contact us.

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Very truly yours,

[redacted]

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Assignment [redacted] 25X1

WORK STATEMENT. TASK 1A

AIR BEARING - TUNNEL TYPE

1. Determine air flow and pressure source.

2. Provide mounting for bearing over water tank. Extend sides to at least 3-inches below surface.

3. Using 9-1/2-inches thin base leader test bearing under various load conditions measure air outlet pressure/flow, cushion stability, flutter of film etc.

4. Repeat tests with 70mm and 5-inches leader.

5. If format changing is necessary, consider design requirements e.g. mechanical against air control.

6. Prepare report giving performance of design, conclusions and recommendations, give all plots, design basis etc.

25X1 [ ] Assignment [ ] 25X1

WORK STATEMENT. TASK 1B

PHASE 1

ROTARY AIR BEARING

This program is the minimum required to produce information to determine the feasilibity and design parameters for a self powered air bearing.

1. Assemble and mount air bearing test bed.

2. Fit two fans and conduct all necessary tests at 5500 approx. R.P.M., with 9-1/2-inches thin base leader tests to include:

   a) Cushion stability and depth evaluation.
   b) Centering of film, drift off center.
   c) Determination of necessity or otherwise of edge guides.

3. Repeat test #2 using 4 fans at 3450 R.P.M. approx.

4. Repeat test #2 using 2-2-1/2-inches dia. wheels facing out.

5. Repeat test #4 by fitting spacers and cage using 2-2-1/2-inches dia. wheels facing in.

6. Repeat test #5 using 2-2-1/2-inches dia. and 2-'-1/2-inches dia. wheels.

7. From results, select most efficient arrangement and test using 9-1/2-inches thin base leader and lifting range of weights.

8. Repeat test using 70m/m and 5-inches widths of leader.

9. Prepare report giving conclusions and recommendations.

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WORK STATEMENT TASK 2

PHASE 1

POSITIVE PRESSURE TRANSPORT CAPSTAN

1. Determine optimum venturi gap.

2. Measure total output of lamb blower.

3. Measure pressure and flow through venturi.

4. Check effect of closing of orifice holes on venturi performance. Measure pressures and flows through orifice holes.

5. Close venturi and apply vacuum to capstan. Use low pressure side of same blower. Measure low pressure output.

6. Repeat all tests made with positive pressure using negative pressure.

7. Determine efficiencies with both positive and negative pressures applied.

8. Using both wet and dry standard types of film determine maximum torque loads before slippage occurs.

9. Repeat test #8 using no air flow to obtain comparative data.

10. Prepare report giving conclusions and recommendations.

[redacted] 25X1

WORK STATEMENT TASK 3

25X1 [redacted] LIQUID BEARING

1. Using perforated cage, determine performance of bearing using 9-1/2-inches width thin base leader with standard load of approximately 1-1/2 lb. at selected R.P.M.'s.

2. To obtain a centering effect, fit a cushion profiling girdle within the cage and repeat test 1 checking for centering of film action.

3. After centering configuration is determined, establish cushion stability under increasing load conditions using 9-1/2-inches width leader at optimum R.P.M.

4. Repeat test 3 using 70 m/m and 5-inches film widths.

5. Replace perforated cage with slotted cage and repeat all tests as necessary.

6. To establish photographic integrity of the bearing, film exposed to an even density level is to be passed over the bearing, to determine if mottling or streaking etc. occurs.

7. Note all results, plot load, pressure and flow charts, estimate H.P., efficiency etc.

8. Prepare report, with conclusions and recommendations and if necessary sketches of proposed production version.

[redacted] 25X1

WORK STATEMENT TASK 4

RESEARCH INTO HEAT SHOCK FILM DEVELOPMENT

1. Conduct a literature research to define state-of-the-art. Note: emphasis should be placed on [redacted] records and reports. 25X1

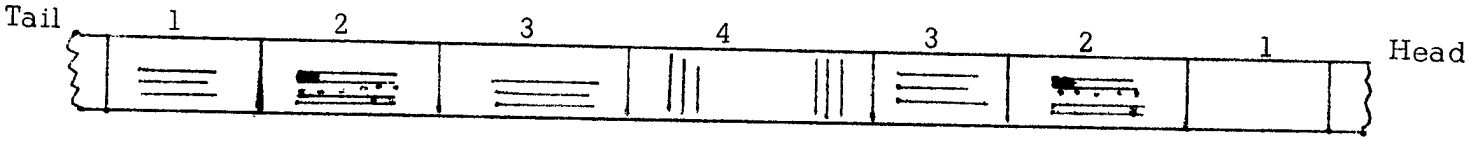
25X1 2. On the basis of previous [redacted] work and on state-of-the-art findings, design a developing test tank utilizing to the full available equipment.

3. Design and construct models of heat shock generators and power supplies.

4. Assemble test tank ready for test program.

5. Prepare samples of the following emulsions: 4400, 4401, 4404, 8430, 5427, 2427.

6. Each sample is to consist of the following.



a) Film evenly exposed to a known density.
b) Step wedges and resolution targets.
c) Exposed areas for heat shock tests.
d) Exposed area rotated by 90 degrees to determine exposure markings.

7. The above test samples can be used for single levels of heat shock application or variable on set levels during run of film, the lengths represented by item 3 would be for this purpose, one length for up seale heat application and the other for down scale.

8. At least three of each sample should be initially prepared.

(more)

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WORK STATEMENT TASK 4 continued

9. A careful recording of all parameters is required, developer temperature and P.H.F.P.M. of transport, energy level of heat shock generator, depth of meniscus and etc.

10. Determine minimum energy levels to maximum energy levels, determine relationship between basic developer temperature, applicator temperature, transport speed FPM, and fog, density, gamma resolution and etc. Record all data in standard terms.

11. As each stage of this program is reached, a detailed scheduled will be prepared.

[redacted] 25X1

WORK STATEMENT TASK 6

PHASE 2

ELEVATED TEMPERATURE SENSITOMETRIC STUDIES

This phase of the program which is an alternative to Phase 1 will study the emulsions used in the original contract, i.e. film type 4400, 4401 and 4404 but in place of holding gamma to a consistent level, a family of three curves for each emulsion will be determined to enable selection of any gamma best suited to a specific subject matter. The resultant performance in terms of time/temperature, resolution and etc. will be determined.

[redacted]

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WORK STATEMENT TASK 8

RESEARCH INTO FILM DRYING TECHNIQUES

This program is designed to investigate new techniques of drying silver halide emulsion film.

1. Conduct a state-of-the-art survey.

2. Consider all possible methods including negative pressure, cold air, chemical evaporators etc.

3. Conduct laboratory tests to determine feasibility, efficiency, etc. of various methods.

4. On the basis of results, prepare a preliminary design incorporating the recommended techniques.

☐ SECRET ☒ CONFIDENTIAL 997604 ☐ UNCLASSIFIED

CONTRACT INSPECTION REPORT

CONTRACT NO.

TASK NO. 25X1

TO:

ENGINEERING SECTION/CB/PD/OL

DATE 27 July 1965

INSPECTION REPORT NO. *(If final, so state)* 7-FINAL

ESTIMATED COMPLETION DATE 30 June 1965

NAME OF CONTRACTOR

TYPE OF COMMODITY OR SERVICE

Film Processor Development Program

THE CONTRACTOR IS ON SCHEDULE ☒ YES ☐ NO

PER CENT OF WORK COMPLETED - 100%

PER CENT OF FUNDS EXPENDED - 100%

THE CONTRACTOR WILL PROBABLY REMAIN WITHIN ALLOCATED FUNDS ☒ YES ☐ NO IF ANSWER IS "NO" ADVISE RECOMMENDATION AND/OR ACTION OF SPONSORING OFFICE, ON REVERSE HEREOF. IF KNOWN, INDICATE MAGNITUDE OF ADDITIONAL FUNDS INVOLVED.

HAS AN INTERIM REPORT, FINAL REPORT, PROTOTYPE, OR OTHER END ITEM BEEN RECEIVED FROM THE CONTRACTOR DURING THE PERIOD? ☐ YES ☒ NO *(If yes, give details on reverse side.)*

HAS GOVERNMENT-OWNED PROPERTY BEEN DELIVERED TO CONTRACTOR DURING THIS PERIOD? ☐ YES ☒ NO *(If yes, indicate items, quantity, and cost on reverse side.)*

INCENTIVES

IS THIS AN INCENTIVE CONTRACT ☐ YES ☒ NO

IF YES, CHECK TYPE ☐ COST ☐ PERFORMANCE ☐ DELIVERY

NOTE:
USE REVERSE SIDE FOR COMMENTS.
FINAL REPORT MUST CONTAIN INCENTIVE EVALUATION.

OVERALL PERFORMANCE OF CONTRACTOR

1. ☐ OUTSTANDING
2. ☐ EXCELLENT
3. ☐ ABOVE AVERAGE
4. ☒ AVERAGE
5. ☐ BELOW AVERAGE
6. ☐ BARELY ADEQUATE
7. ☐ UNSATISFACTORY

IF OVERALL PERFORMANCE OF CONTRACTOR IS UNSATISFACTORY OR BARELY ADEQUATE, INDICATE REASONS ON REVERSE SIDE.

RECOMMENDED ACTION

☐ CONTINUE AS PROGRAMMED

☐ WITHHOLD PAYMENT PENDING SATISFACTORY PERFORMANCE

☒ TERMINATE - Final Report

☐ OTHER *(Specify)*

IF TERMINATION IS RECOMMENDED OR IF THIS IS A FINAL REPORT PUT COMMENTS ON REVERSE IN NARRATIVE FORM ON CONTRACTOR'S PERFORMANCE AND CERTIFY THAT ALL DELIVERABLE ITEMS UNDER THE CONTRACT HAVE BEEN RECEIVED. THESE INCLUDE, WHERE APPLICABLE, THE FOLLOWING:

ITEM	REC'D	DOES NOT APPLY	ITEM	REC'D	DOES NOT APPLY
PROTOTYPES			MANUALS		
DRAWINGS AND SPECIFICATIONS			FINAL REPORT		
PRODUCTION AND/OR OTHER END ITEMS			SPECIAL TOOLING		
			OTHER GOVERNMENT PROPERTY		

DATE OF LAST CONTACT WITH CONTRACTOR 19 July 1965

SIGNATURE OF INSPECTOR

DIVISION P & D S

INSPECT

SIGNATURE OF APPROVER

FORM 10-64 1897 USE PREVIOUS EDITION ☐ UNCLASSIFIED ☐ CONFIDENTIAL ☐ SECRET (12-36)

NARRATIVE REPORT | ☐ INTERIM ☒ FINAL

This report constitutes a final contract inspection under [redacted] At the present writing, all reports have not been received on the study efforts, however they are in final review and should be received by 15 August 1965. The contractor's effort on this study program has been very good and, although hampered by a late start due to slow investigation team organization, has produced a considerable amount of previously unrecorded information. Those contactual efforts which have not been completed under [redacted] will be brought to fruition under [redacted] continuation of the present effort. 25X1